

App. Serial No. 10/538,217
Docket No.: NL021418 US

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Remarks

Claims 1-10 are currently pending in the patent application. For the reasons and arguments set forth below, Applicant respectfully submits that the claimed invention is allowable over the cited references.

Firstly, the non-final Office Action dated February 1, 2007 indicated an objection to Figure 4, an objection to the specification, and an informality regarding claims 1, 3 and 9.

Regarding these objections, Applicant has made the appropriate corrections, in a manner consistent with that suggested by the Examiner, as is indicated on pages 2-6 of this paper. Accordingly, Applicant requests that the objections be removed.

Secondly, the non-final Office Action dated February 1, 2007 listed the following two rejections: Claims 9-10 stand rejected under 35 U.S.C. § 102(b) over Murphy (U.S. 6,444,528); and claims 1-2, 4-6 and 8 stand rejected under 35 U.S.C. § 103(a) over Murphy in view of Lynch *et al.* (U.S. 4,643,804). In addition, claims 3 and 7 are indicated as potentially allowable, if rewritten in independent form to include the limitations of the base claim and any intervening claims.

Applicant has added new independent claim 11, which incorporates limitations of claims 1 and 3 including those limitations for which it is believed the Office Action indicated that claim 3 was allowable. As such, Applicant submits that claim 11 is in condition for allowance. New dependent claims 12-16 contain each of the limitations of claim 11, from which they depend, and thus should also be allowable.

Applicant respectfully traverses the Section 102(b) rejection of claims 9-10 because the cited portions of the Murphy reference fail to correspond to all of the claimed limitations including those directed to a thick oxide plug formed of oxidized porous silicon at the base of the trench. The Office Action asserts that this is a product by process limitation and thus does not give patentable weight to the limitation. However, this limitation is not a product by process limitation. Claim 9 recites a thick oxide plug formed of oxidized porous silicon; the claim specifies what the plug is made of (*i.e.*, oxidized porous silicon), not the process by which the plug is made. Thus, the claimed plug is made of silicon that is both oxidized and porous. Moreover, the cited portions of the Murphy reference do not teach that the bottom layer 27 of the gate dielectric layer

App. Serial No. 10/538,217
Docket No.: NL021418 US

contains silicon that is both oxidized and porous, as does the oxide plug of the claimed invention. Accordingly, the Section 102(b) rejection of claims 9-10 is improper and Applicant requests that it be withdrawn.

Applicant respectfully traverses the Section 103(a) rejection of claims 1-2, 4-6 and 8 because there is no motivation to modify Murphy with the cited portions of the Lynch reference. The Office Action acknowledges that the Murphy reference does not teach etching the silicon at the base of the trench to form porous silicon and thermally oxidizing the porous silicon to form a plug. In an attempt to overcome these deficiencies, the Office Action cites to portions of the Lynch reference that allegedly correspond to these claimed limitations. The Office Action asserts that one of skill in the art would be motivated to combine the teaching of Lynch with Murphy in order to "minimize the stress level in the plug region and improve the electrical characteristics of trenches that include bottoms having surface roughness and/or sharp or irregular corners" as taught by Lynch. *See, e.g.*, the Abstract and Col. 4:45-46. However, the Office Action fails to establish that the Murphy reference is susceptible to these problems. Moreover, the Office Action has not presented any evidence that modifying Murphy with the cited teaching of Lynch would in any way "minimize the stress level in the plug region."


The cited portions of the Murphy reference teach that the bottom 53 of the first trench 34 is etched to form a second trench; etching the bottom of the first trench would necessarily remove any surface roughness and/or irregular corners. *See, e.g.*, Figure 10 and Col. 6:15-24. The cited portions of the Murphy reference also teach that the bottom 53 of the first trench 34 may be treated with a rounding etch process to round sharp corners where the sidewalls and the bottom of the first trench intersect. *See, e.g.*, Col. 6:25-33. The cited portions of the Murphy reference further teach that a selective oxide plug 56 is deposited on the wafer to fill the second trench 54 up to the bottom surface of the first trench. *See, e.g.*, Figure 11 and Col. 6:34-36. As is shown in Figure 2, the bottom 17 of Murphy's trench 10 does not have "surface roughness and/or sharp or irregular corners." Thus, one of skill in the art would not be motivated to modify Murphy to address problems that do not exist. Accordingly, the Section 103(a) rejection of claims 1-2, 4-6 and 8 is improper and Applicant requests that it be withdrawn.

App. Serial No. 10/538,217
Docket No.: NL021418 US

In view of the remarks above, Applicant believes that the rejections have been overcome and that the application is in condition for allowance. Should there be any remaining issues that could be readily addressed over the telephone, the Examiner is asked to contact the agent overseeing the application file, Peter Zawilski, of NXP Corporation at (408) 474-9063.

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Attachment: 1 Replacement Drawing Sheet